Angebot im WiSe 2025/ 26 von zusätzlichen Vertiefungswahlmodulen für die Bachelor-Studiengänge MBB und MSEB ab Immatrikulation im WiSe 2021/ 22:

Studiengang	Bachelor-Studiengang Maschinenbau und Motorsport Engineering
Modulbezeichnung	**Finite Elemente Methode**
Modul-Nr.	FMBMB 2150
ggf. Lehrveranstaltungen	
Studiensemester	5.
Dauer des Moduls	1 Semester
Häufigkeit des Moduls	Jährlich
Modulverantwortliche(r)	Prof. Dr.-Ing. Jana Wilmers
Lehrsprache	Deutsch oder Englisch
Art der Lehrveranstaltung	Pflichtmodul
Lehrform / SWS	Seminaristischer Unterricht: 4 SWS
Arbeitsaufwand	150 h (64 h Präsenzstudium + 86 h Selbststudium)
ECTS-Punkte (Kreditpunkte)	5
Voraussetzungen für Teilnahme gemäß Prüfungsordnung	Keine
Empfohlene Voraussetzungen	Technische Mechanik, Informatik
Qualifikationsziele / angestrebte Lernergebnisse	<u>Fachkompetenzen</u> Nach Absolvieren des Moduls kennen die Studierenden: • Grundprinzipien der Finite Elemente-Theorie • Prinzipien der Diskretisierung • verschiedene Elementtypen und ihre Eigenschaften • Grundlagen der programmatischen Umsetzung der FEM <u>Methodenkompetenzen</u> Nach Absolvieren des Moduls können die Studierenden: • Aufbau und Ablauf von FEM-Simulationen verstehen und erläutern • mechanische Probleme unter statischen Lasten selbstständig mit der FEM berechnen und ihre Ergebnisse gegenüber Spezialisten präsentieren und diskutieren <u>Sonstige Kompetenzen</u> • Fähigkeit zur Abstraktion und Umsetzung mechanischer Probleme in der FEM • Teamfähigkeit und Kooperationsbereitschaft durch gemeinsame praktische Arbeit • Eigenständige Bearbeitung eines komplexen Sachverhalts über längere Zeit
Inhalt	Grundprinzipien und Hintergründe der FEM, variationelle Form mechanischer Grundgleichungen, Ansatzfunktionen, Diskretisierung, Elementtypen, Programmieren einfacher finiter Elemente
Studien-/ Prüfungsleistungen/ Prüfungsformen	Experimentelle Arbeit ca. 45 Stunden; alternative Prüfungsleistungen siehe Fachprüfungsordnung
Lernmethoden, Medienform	Interaktive PPT-Vorträge und Tafelarbeit, Gruppenarbeit, praktische Arbeit mit FE-Software, Programmieren eigener Lösungen
Literatur	Vermerk: es werden immer die aktuellsten Auflagen verwendet und in den Vorlesungen empfohlen

	Bathe, K.J.: Finite-Elemente-Methoden. 2. Auflage, Springer-Verlag Zienkiewicz, O.C.: Methoden der finiten Elemente. 2. Auflage. Leipzig: Fachbuchverlag Zusätzliche Literatur und Unterlagen werden in der Veranstaltung geteilt

Folgende englischsprachigen Vertiefungswahlmodule werden als zusätzliches Angebot nur im WiSe 2025/26 angeboten:

Studiengang /course of studies	Bachelor-Studiengänge Maschinenbau und Motorsport Engineering
Modulbezeichnung / module name	**Flight Performance**
Kürzel / code	FMBMB 4610
Studiensemester / semester(s), in which the module is taught	5. (winter semester)
Dauer des Moduls / Duration of the module	1 Semester
Häufigkeit des Modulangebots / frequency of module offer	WiSe 2025/ 26
Modulverantwortliche(r) / person responsible for the module	Dr. Wei Shyang Chang
Sprache / language	Englisch (english)
Zuordnung zum Curriculum / relation to curriculum	Vertiefungswahlmodul (elective)
Lehrform (type of teaching) / SWS (contact hours per week)	Übung (turorial): 2 SWS Seminaristischer Unterricht (seminar-style lecture): 2 SWS
Arbeitsaufwand / workload	150 hours (64 h contact time + 86 h self-study)
ECTS-Punkte / ECTS credit points	5
Voraussetzungen nach Prüfungsordnung / requirements according to the examination regulation	Praktischer Übungsteil (practical exercises)
Empfohlene Voraussetzungen / recommended prerequisites	MATLAB knowledge
Qualitikationsziele (module objectives) / angestrebte Lernergebnisse (intended learning outcomes)	<u>Fachkompetenzen (professional skills)</u> The students will be able to - Apply flight performance theories to solve problems related to the performance of propeller and jet aircraft in steady and accelerated flight conditions. - Assess and propose methods to improve flight performance through case studies that reflect real-world aviation scenarios. <u>Methodenkompetenzen (methodological skills)</u> The students will be able to - Develop and implement MATLAB programs to perform quantitative analysis of aircraft flight performance. - Structure and document project outcomes effectively through technical reports, oral presentations, and reflective writing that demonstrates a systematic approach to problem-solving.

	<u>Soziale Kompetenzen (social skills)</u> The students will be able to - Collaborate in teams to complete technical tasks such as coding, reporting, and presenting results of flight performance analysis. - Reflect on individual learning progress and group dynamics through structured self-assessments and peer feedback.
Inhalt / content	This course introduces students to the fundamental principles governing the flight performance of fixed-wing aircraft, focusing on both steady and accelerated flight conditions. Through a combination of lectures, problem-solving sessions, MATLAB-based computational projects, and group presentations, students will progressively build the professional and methodological competencies required in the aerospace industry. The course begins with an overview of flight mechanics, including the forces of flight and equations of motion. It then explores steady flight scenarios such as cruise, climb, glide, and ceiling performance, incorporating key performance metrics like thrust, power, stall speed, range, and endurance. Accelerated flight topics include turning maneuvers, pull-up and pull-down trajectories, and energy-based performance analysis. The course concludes with an examination of take-off and landing performance. Throughout the course, students will engage in case studies and group assignments to apply theoretical knowledge in realistic contexts. They will also develop MATLAB programs to analyze flight data and reflect on their learning and teamwork processes through reports and presentations, enhancing both technical and social skill development.
Studien-/ Prüfungsleistungen/ Prüfungsformen (study and examination requirements and forms of examination)	Klausur 120 Minuten (written exam 120 minutes)
Medienformen / types of media	Lecture slides and notes (PDF, PowerPoint), MATLAB programming environment, Whiteboard/Chalkboard for in-class derivations, Project presentations (oral and visual aids)
Literatur / reading list	Aircraft Performance: An Engineering Approach, Mohammad H. Sadraey, CRC Press, Second Edition, 2024. Aircraft Performance and Design: An Introduction to Principles and Practice, Ambar K Mitra, Library of Congress, Second Edition, 2020. Aircraft Performance and Design, John D. Anderson, Jr., McGraw-Hill, 1999

Studiengang /course of studies	Bachelor-Studiengänge Maschinenbau und Motorsport Engineering
Modulbezeichnung / module name	**Introduction to Space Systems**
Kürzel / code	FMBMB 4620
Studiensemester / semester(s), in which the module is taught	5. (winter semester)
Dauer des Moduls / Duration of the module	1 Semester
Häufigkeit des Modulangebots / frequency of module offer	WiSe 2025/ 26
Modulverantwortliche(r) / person responsible for the module	Dr. Wei Shyang Chang
Sprache / language	Englisch (english)
Zuordnung zum Curriculum / relation to curriculum	Vertiefungswahlmodul (elective)
Lehrform (type of teaching) / SWS (contact hours per week)	Übung (turorial): 2 SWS Seminaristischer Unterricht (seminar-style lecture): 2 SWS
Arbeitsaufwand / workload	150 hours (64 h contact time + 86 h self-study)
ECTS-Punkte / ECTS credit points	5
Voraussetzungen nach Prüfungsordnung / requirements according to the examination regulation	Semesterbegleitendes Testat (semester-accompanying test)
Empfohlene Voraussetzungen / recommended prerequisites	None
Qualitikationsziele (module objectives) / angestrebte Lernergebnisse (intended learning outcomes)	<u>Fachkompetenzen (professional skills)</u> The students will be able to: - Apply fundamental engineering concepts to explain the principles and functions of major spacecraft subsystems. - Analyse subsystem design choices in the context of specific space mission requirements. <u>Methodenkompetenzen (methodological skills)</u> The students will be able to: - Integrate subsystem knowledge to evaluate spacecraft configurations and system-level trade-offs. - Use structured approaches to map mission objectives to subsystem design requirements. <u>Soziale Kompetenzen (social skills)</u> The students will be able to: - Collaborate in teams to propose mission concepts and present spacecraft subsystem architectures. - Communicate technical ideas clearly through presentations and written summaries tailored to both specialist and non-specialist audiences.
Inhalt / content	This course provides an introductory yet comprehensive overview of space systems, with a focus on understanding how engineering principles are applied to the design and operation of spacecraft. Students will explore the functional roles of various spacecraft subsystems in supporting different types of space missions.

	The course begins by discussing the significance of space activities and the diverse applications of space technology in modern society. Students will then gain a foundational understanding of orbital mechanics and how spacecraft are placed into and recovered from orbit. Core topics include the basic principles of rocket propulsion and the key characteristics of launch vehicles. Building on this foundation, the course introduces the principles of space system engineering and provides an overview of major spacecraft subsystems such as power, communication, thermal control, attitude control, and propulsion. Students will learn to apply subsystem knowledge to specific mission scenarios, analyzing how system components must work together to meet mission goals. Learning is supported through problem-based assignments, conceptual design exercises, and team presentations. Emphasis is placed not only on technical understanding but also on developing collaborative and communication skills necessary for interdisciplinary space system development.
Studien-/ Prüfungsleistungen/ Prüfungsformen (study and examination requirements and forms of examination)	Klausur 120 Minuten (written exam 120 minutes)
Medienformen / types of media	Lecture slides and notes (PDF, PowerPoint), Whiteboard/Chalkboard for in-class derivations
Literatur / reading list	Jerry Jon Sellers, (2015), Understanding Space, McGraw-Hill. Fortescue, P., Swinerd, G., & Stark, J. (2011), Space Mission Engineering: The New SMAD, Satellite Techology Library. John D. Anderson, Jr., (2005), Introduction to Flight, McGraw-Hill.